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Report of the individual review of the annual submission of Japan submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2013 annual submission of Japan, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 30 September to 5 October 2013 in Tokyo, Japan, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalist – Ms. Maria Lidén (Sweden); energy – Mr. Paul Duffy (Ireland); industrial processes and solvent and other product use – Ms. Pia Forsell (Finland); agriculture – Mr. Renato Rodrigues (Brazil); land use, land-use change and forestry (LULUCF) – Ms. Andrea Brandon (New Zealand); and waste – Ms. Medea Inashvili (Georgia). Ms. Inashvili and Ms. Lidén were the lead reviewers. The review was coordinated by Ms. Astrid Olsson (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Japan, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2012 annual review report of Japan was published after the submission of the 2013 annual submission.

3. In 2011, the main greenhouse gas (GHG) in Japan was carbon dioxide (CO_2), accounting for 94.8 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by nitrous oxide (N_2O) (1.7 per cent) and methane (CH_4) (1.6 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.9 per cent of the overall GHG emissions in the country. The energy sector accounted for 91.3 per cent of total GHG emissions, followed by the industrial processes sector (5.1 per cent), the agriculture sector (2.0 per cent), the waste sector (1.6 per cent) and the solvent and other product use sector (0.01 per cent). Total GHG emissions amounted to 1,387,384.22 Gg CO_2 eq and increased by 4.1 per cent between the base year[2] and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

5. Additional background data on recalculations by Japan in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from Annex A sources only.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year[a] to 2011

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A sources		CO_2	1 141 137.74	1 141 137.74	1 223 687.33	1 251 460.72	1 213 829.51	1 141 465.31	1 191 068.27	1 240 684.47	8.7
		CH_4	32 131.07	32 131.07	29 899.43	26 133.74	21 750.29	21 174.84	20 740.65	20 299.10	–36.8
		N_2O	32 037.79	32 037.79	33 146.55	29 393.67	23 117.14	22 946.90	22 358.53	21 979.42	–31.4
		HFCs	20 260.17	17 930.00	20 260.17	18 800.43	15 298.30	16 554.17	18 307.23	20 467.03	1.0
		PFCs	14 271.14	5 670.00	14 271.14	9 583.35	4 615.07	3 265.25	3 408.71	3 016.35	–78.9
		SF_6	16 961.45	38 240.00	16 961.45	7 188.49	3 795.22	1 851.27	1 862.42	1 637.85	–90.3
KP-LULUCF	Article 3.3[b]	CO_2					2 214.77	2 832.65	4 608.38	1 577.02	
		CH_4					0.03	0.01	0.01	0.01	
		N_2O					3.09	3.21	3.04	2.86	
	Article 3.4[c]	CO_2	–77.87				–48 012.08	–49 848.03	–54 417.24	–53 751.43	NA
		CH_4	NO				12.87	5.27	2.63	3.48	NA
		N_2O	NO				1.31	0.53	0.27	0.35	NA

Abbreviations: KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2011

		Gg CO_2 eq							*Change (%)*
	Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A	Energy	1 078 975.30	1 078 975.30	1 156 752.34	1 190 844.26	1 161 564.51	1 096 944.90	1 144 962.32	1 194 479.89	10.7
	Industrial processes	119 992.98	130 340.22	121 360.75	94 345.19	70 705.45	63 529.22	65 849.37	67 163.75	–44.0
	Solvent and other product use	287.07	287.07	437.58	340.99	129.10	120.50	98.95	97.15	–66.2
	Agriculture	31 565.64	31 565.64	30 360.23	27 937.75	26 267.59	25 960.19	25 882.56	25 758.06	–18.4
	Waste	25 978.36	25 978.36	29 315.17	29 092.22	23 738.87	20 702.93	20 952.60	20 585.38	–20.8
	LULUCF	NA	–69 532.34	–80 593.70	–85 977.95	–78 125.28	–74 088.51	–75 771.61	–75 434.10	NA
	Total (with LULUCF)	**NA**	**1 197 614.26**	**1 257 632.37**	**1 256 582.46**	**1 204 280.24**	**1 133 169.23**	**1 181 974.20**	**1 232 650.12**	**NA**
	Total (without LULUCF)	**1 256 799.36**	**1 267 146.60**	**1 338 226.07**	**1 342 560.41**	**1 282 405.52**	**1 207 257.74**	**1 257 745.81**	**1 308 084.22**	**4.1**
	Other[b]	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA
KP-LULUCF	Article 3.3[c] Afforestation and reforestation					–426.83	–441.27	–456.02	–462.04	
	Article 3.3[c] Deforestation					2 644.68	3 277.13	5 067.44	2 021.92	
	Total (3.3)					**2 217.85**	**2 835.86**	**4 611.43**	**1 559.88**	
	Article 3.4[d] Forest management					–46 917.90	–48 732.58	–53 286.10	–52 606.06	
	Article 3.4[d] Cropland management	NA				NA	NA	NA	NA	NA
	Article 3.4[d] Grazing land management	NA				NA	NA	NA	NA	NA
	Article 3.4[d] Revegetation	–77.87				–1 080.00	–1 110.44	–1 128.23	–1 141.54	1 365.9
	Total (3.4)	**–77.87**				**–47 997.90**	**–49 843.03**	**–54 414.34**	**–53 747.59**	**NA**

Abbreviations: KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2013 annual inventory submission was submitted on 12 April 2013; it contains a complete set of common reporting format (CRF) tables for the period 1990–2011 and an NIR. Japan also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 12 April 2013.

7. Japan officially submitted revised emission estimates on 8 November 2013 in response to the list of potential problems and further questions raised by the ERT. All values in this report are based on the submission of revised estimates on 8 November 2013.

8. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

9. Table 3 contains the ERT's overall assessment of the annual submission of Japan. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

		General findings and recommendations
The expert review team's (ERT's) findings on completeness of the 2013 annual submission		
Annex A sources[a]	Not complete	Mandatory: "NE" is reported for actual emissions of F-gases for the years 1990–1994. The ERT recommends that Japan provide these estimates in its annual submission Non-mandatory: "NE" is reported for CO_2 emissions from coal mining and handling; CO_2, CH_4 and N_2O emissions from solid fuel transformation; CO_2 emissions from refining/storage of oil; CO_2 and CH_4 emissions from distribution of oil products; CO_2 emissions from asphalt roofing and road paving with asphalt; CH_4 emissions from ammonia and aluminium production; actual emissions of HFCs from metal production; CO_2 emissions from degreasing and dry cleaning, and from chemical products, manufacture and processing; CH_4 emissions from poultry in enteric fermentation; CH_4 and N_2O emissions from wastewater from

		General findings and recommendations
		industrial wastewater and from domestic and commercial wastewater
Land use, land-use change and forestry[a]	Not complete	Mandatory: "NE" is reported for carbon stock changes in dead organic matter and mineral soils for other land converted to cropland, grassland and wetlands; carbon stock changes in living biomass and for wild land (a country-specific subdivision) for grassland remaining grassland; carbon stock changes in organic soils for grazed meadow (a country-specific subdivision); carbon stock changes in soils for all land categories converted to wetlands except for forest land converted to wetlands, and for cropland and grassland converted to other land; N_2O emissions from disturbance associated with land-use conversion to cropland for mineral soils for grassland and other land converted to cropland; CO_2, CH_4 and N_2O emissions from biomass burning from controlled burning for cropland remaining cropland and from controlled burning and wildfires for grassland remaining grassland; wildfires from forest land converted to grassland and wetlands. The ERT reiterates the recommendation made in the previous review report that Japan calculate the missing mandatory estimates and report them in its annual submission, in order to improve completeness
		Non-mandatory: "NE" is reported for carbon stock changes in dead organic matter for wild land (a country-specific subdivision) and for grassland remaining grassland; all carbon stock changes for flooded lands for wetlands remaining wetlands; all carbon stock changes for "other than urban green area" and "urban green areas not subject to RV" for settlements remaining settlements; CO_2, CH_4 and N_2O emissions from biomass burning from controlled burning and wildfires for wetlands remaining wetlands
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency in the 2013 annual submission	Generally consistent	Japan has reported an inconsistent time series for actual emissions of F-gases (see paras. 42 and 46 below)
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual submission	Sufficient	See paragraphs 10 and 13 below

		General findings and recommendations
The ERT's findings on the transparency of the 2013 annual submission	Not sufficient	See paragraphs 11, 17, 21, 26, 27, 28, 30, 31, 34, 38, 43, 51, 52, 53, 54, 55, 56, 57, 58, 64, 66, 68, 69, 70, 71, 72, 73, 75, 76, 77, 79, 80, 94, 99, 101, 102, 103, 104, 105 and 106 below The ERT recommends that Japan provide relevant information in all the documentation boxes of the CRF tables, in accordance with the footnotes to those tables

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, F-gases = fluorinated gases, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NE = not estimated, RV = revegetation.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

10. The NIR and additional information provided by Japan during the review described the national system for the preparation of the inventory. The Ministry of the Environment (MOE) has overall responsibility for the national inventory. The Greenhouse Gas Inventory Office of Japan (GIO) (within the Center for Global Environmental Research of the National Institute for Environmental Studies) compiles the inventory. Other ministries and organizations are also involved in the preparation of the inventory, mainly by providing data (i.e. the Ministry of Economy, Trade and Industry; the Ministry of Land, Infrastructure, Transport and Tourism; the Ministry of Agriculture, Forestry and Fisheries; the Ministry of Health, Labour and Welfare; the Federation of Electric Power Companies of Japan; the Japan Coal Energy Center; the Japan Cement Association; the Japan Iron and Steel Federation; and the Japan Paper Association). Private consulting companies are contracted by MOE to perform tasks related to inventory compilation and quality control (QC). The Committee for the Greenhouse Gas Emission Estimation Methods, run by MOE, discusses and defines the methods, activity data (AD) and emission factors (EFs) used. It leads seven working groups (called "breakout groups" in the NIR) on energy and industrial processes, transport, fluorinated gases (F-gases), agriculture, LULUCF, waste and non-methane volatile organic compounds (NMVOCs). Japan has a well-developed quality assurance/quality control (QA/QC) plan, which has included, since 2009, a Quality Assurance Working Group established as a result of discussions within the aforementioned committee.

11. The description of the national system in chapter 1 of the 2013 NIR is very brief and not sufficiently transparent. However, annex 6.1 to the NIR includes additional information that provides a better understanding of the national system. The ERT recommends that Japan move all information from annex 6.1 to chapter 1 of the NIR and also include additional information on the national system as provided by the Party in its presentation to the ERT during the review.

Inventory preparation

12. Table 4 contains the ERT's assessment of Japan's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Japan

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	Level and trend key category analysis performed, including and excluding LULUCF
Approach followed?	Both tier 1 and tier 2	
Were additional key categories identified using a qualitative approach?	No	
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Are there any changes to the key category analysis in the latest submission?	No	
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	
Quantitative uncertainty (including LULUCF)	Level = 2% Trend = 2%	
Quantitative uncertainty (excluding LULUCF)	Level = not provided Trend = not provided	See paragraph 14 below

Abbreviation: LULUCF = land use, land-use change and forestry.

13. Detailed QC procedures are used in the inventory and are well documented; however, there is still room for improvement as the ERT identified some inconsistencies between the NIR and the CRF tables (see paras. 23, 24, 86 and 91 below). The ERT reiterates the recommendation made in the previous report that Japan strengthen its QC procedures in order to avoid inconsistencies between the NIR and the CRF tables in its annual submission.

14. Information on the total uncertainty including LULUCF as well as detailed information on the uncertainties for all sectors is provided in the NIR (level and trend); however, no information is provided on the total uncertainty (level or trend) excluding LULUCF. The ERT encourages Japan to include this information in its annual submission.

Inventory management

15. Japan has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. The archiving system is run by GIO and includes electronic and paper versions of documents. During the review, the ERT was provided with the requested additional archived information.

4. Follow-up to previous reviews

16. A number of improvements have been made in the 2013 annual submission, including the provision of sectoral tables on the effects of the recalculations in chapter 10 of the NIR; the inclusion of updated information in annex 2 to the NIR relating to identified issues between the CRF tables and International Energy Agency (IEA) data; the provision of additional information in annex 2 on the quality standard for diesel oil; the inclusion of additional information in the columns "Associated CO_2 emissions" and "Allocated under" in CRF table 1.A(d); the provision of more information in the NIR concerning the operation of emission reduction or destruction units in all manufacturing facilities of HCFC-22; the improvement of the consistency between the NIR and the CRF tables for the LULUCF sector; the reporting of some of the previously missing estimates for the LULUCF sector and the KP-LULUCF activities; the separate reporting of estimates for the carbon stock changes in mineral and organic soils; the improvement of transparency in the reproduced equations in the NIR for the LULUCF sector; and the implementation of some of the planned improvements for the waste sector.

17. The ERT commends Japan for providing sectoral tables on the effects of the recalculations in tables 10-1 to 10-8 in chapter 10 of the NIR. The ERT recommends that Japan improve the text descriptions in the NIR to ensure that the recalculations for all sectors are transparently described in the annual submission.

18. The previous review report contained 73 recommendations. The ERT notes that as the 2012 annual review report was published after the due date for the 2013 annual submission, it has not been possible for Japan to address all of these recommendations in the 2013 annual submission. However, 22 of the recommendations in the 2012 annual review report were reiterated from previous review reports, and some have been reiterated for several years. The ERT strongly recommends that Japan consider ways to address the implementation of the ERT's recommendations in a timely manner. The recommendations that have not yet been implemented by the Party are reiterated in the relevant chapters of this report and are listed in table 8 below. The ERT encourages Japan to provide, in the inventory report, a complete record of all recommendations made in the 2012 and 2013 review reports, including the status of each issue, a timeline for the implementation of each

recommendation and, where applicable, information explaining why the recommendation has not yet been implemented.

5. Areas for further improvement identified by the expert review team

19. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 8 below.

B. Energy

1. Sector overview

20. The energy sector is the main sector in the GHG inventory of Japan. In 2011, emissions from the energy sector amounted to 1,194,479.89 Gg CO_2 eq, or 91.3 per cent of total GHG emissions. Since 1990, emissions have increased by 10.7 per cent. The key drivers for the rise in emissions are the increases in emissions in the energy industries and transport categories by 44.1 per cent and 4.2 per cent, respectively, since 1990. In particular, total GHG emissions from public electricity and heat production have increased by 48.1 per cent since 1990. Emissions increased steadily from 1990 to 2007, decreased in 2008 and 2009 due to the economic recession, and increased significantly in 2011 due to the increase in electricity production from oil and natural gas following the closure of several nuclear power plants after the East Japan Great Earthquake in March 2011. Within the sector, 39.2 per cent of the emissions were from energy industries, followed by 28.3 per cent from manufacturing industries and construction, 18.8 per cent from transport and 13.7 per cent from other sectors. The remaining 0.03 per cent were from fugitive emissions from fuels.

21. The ERT notes that Japan has not provided any additional information in its 2013 annual submission on the drivers of the emission trends as recommended in the previous review report. The ERT reiterates the recommendation made in the previous review report that the Party provide additional information on the drivers of the trends for the energy sector to improve transparency; in particular, additional information on electricity consumption, the quantity of oil refined, vehicle statistics and fuel use in transport, household numbers and occupancy levels as provided to the ERT during the review, given the contribution of this sector to total national emissions.

2. Reference and sectoral approaches

22. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 23–28 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross-references
Difference between the reference approach and the sectoral approach	Energy consumption: –368.19 PJ, –2.10%	
	CO_2 emissions: –5,301.76 Gg CO_2 eq, –0.45%	23–24
Are differences between the reference	NIR: yes	23

		Paragraph cross-references
approach and the sectoral approach adequately explained in the NIR and the CRF tables?	CRF tables: no	
Are differences with international statistics adequately explained?	Yes	25
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	26
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	No	27–28

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

23. The previous review report identified a relatively large difference in CO_2 emissions between the reference approach and the sectoral approach for solid fuels for 2008 (5.26 per cent). In response to a recommendation made in the previous review report, Japan has provided additional information explaining the differences in energy amounts and CO_2 emissions between the reference approach and the sectoral approach in annex 4 to its NIR. The ERT commends Japan for providing this information. The ERT recommends that Japan complete the documentation box in CRF table 1.A(c), briefly explaining the differences between the two approaches and referencing the information provided in annex 4 to the NIR.

24. Japan reported production of coal as not occurring ("NO") in the reference approach in CRF table 1.A(b) for all years from 2002 to 2011. However, coal production does take place in Japan and fugitive emissions from coal mining are reported in CRF table 1.B based on the AD provided in table 3-35 of the NIR. The ERT notes that this inconsistency may affect the differences between the reference and sectoral approaches highlighted in paragraph 23 above. The ERT reiterates the recommendation made in the previous review report that Japan address this inconsistency in its annual submission by providing coal production data in CRF table 1.A(b).

25. The ERT commends Japan for updating the information provided in annex 2 to its NIR relating to identified discrepancies between the CRF tables and the IEA data, and in response to a recommendation made in the previous review report by providing additional information on the quality standard for diesel oil in the 2013 annual submission in section A2.3 of annex 2.

International bunker fuels

26. The previous review report noted that the CO_2 implied emission factor (IEF) for jet kerosene reported in CRF table 1.C (67.14 t/TJ based on the gross calorific value, or 70.67 t/TJ based on the net calorific value), is lower than the EF for jet kerosene included in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) (19.5 t C/TJ, or 71.5 t CO_2/TJ). In response to a question raised by the ERT during the review, Japan informed the ERT that

its CO_2 EF is higher than that used by other reporting Parties including Greece, Portugal, Turkey and the United Kingdom of Great Britain and Northern Ireland. The ERT reiterates the recommendation made in the previous review report that Japan provide additional information on the method used to derive this country-specific EF in its annual submission to improve transparency.

Feedstocks and non-energy use of fuels

27. The previous review reports have recommended that Japan report CO_2 emissions from the combustion of solid fuels in the non-ferrous metals category separately in the energy sector from the solid fuels used as feedstocks, reducing agents or anodes reported in the industrial processes sector. The ERT notes that Japan continues to report all CO_2 emissions (combustion and process) together under the energy sector, which is not in accordance with the Revised 1996 IPCC Guidelines. In response to a question raised by the ERT during the review, the Party explained that it considers that the approach used (which is in line with the information provided by the *General Energy Statistics*[3]) ensures the complete accounting of GHGs, taking into account the guidance regarding the double counting of emissions provided in the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance). The ERT notes Japan's explanation but reiterates the recommendation made in previous review reports that the Party report CO_2 emissions from solid fuels used as feedstock under the industrial processes sector to enhance transparency and comparability between reporting Parties' submissions.

28. The ERT finds that the Party's reporting of feedstocks and non-energy use of fuels is not fully transparent and could be improved in section 3.2.9 of the NIR. The ERT recommends that Japan provide additional information in its annual submission clearly showing the feedstock amounts for each fuel type and the corresponding category where emissions occur or carbon is stored, consistent with the information provided in CRF table 1.A(d), and revise tables 3-12, 3-13, 3-28 and 3-31 of the NIR, clarifying the references to fuel codes "#9xxx".

3. Key categories

Stationary combustion: liquid, solid and gaseous fuels – CH_4 and N_2O[4]

29. Japan estimated CH_4 and N_2O emissions from stationary combustion plants in energy industries and manufacturing industries and construction using country-specific tier 2 EFs. These EFs were derived from measurement data, as referenced in NIR table 3-9, which were collected in different prefectures in Japan from 1991 to 2000. The ERT notes that the CH_4 and N_2O IEFs for 2011 for liquid fuels in energy industries (0.16 kg/TJ and 0.36 kg/TJ, respectively), the CH_4 IEF for solid fuels (0.16 kg/TJ) and the CH_4 IEF for gaseous fuels (0.26 kg/TJ) are some of the lowest values reported by Parties included in Annex I to the Convention (Annex I Parties). The CH_4 and N_2O IEFs for liquid fuels in energy industries range from 0.06 kg/TJ to 4.00 kg/TJ and from 0.05 kg/TJ to 4.57 kg/TJ, respectively, and the CH_4 IEFs for solid and gaseous fuels in energy industries range from 0.10 kg/TJ to 7.75 kg/TJ and from 0.29 kg/TJ to 100.67 kg/TJ, respectively, for Annex I Parties. The ERT finds that the information provided in the NIR is not sufficiently transparent to assess how these EFs were estimated or derived for each fuel type. In response to a question raised by the ERT during the review, Japan provided additional

[3] Agency for Natural Resources and Energy, *General Energy Statistics*.

[4] Not all emissions related to all gases under this category are key categories, particularly CH_4 emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

information on the measurements that were conducted by category, by fuel and by furnace type.

30. The ERT recommends that Japan provide in its NIR a table showing all country-specific CH_4 and N_2O EFs, by individual fuel, category and furnace type to improve the transparency of its reporting, elaborating on the information currently provided in NIR table 3-10. The ERT also recommends that Japan provide additional information on the actual measurements recorded and on how these measurement data are used to derive the EFs.

31. The ERT finds that the measurement data used to derive the EFs are based on studies which were conducted in the 1990s and may not be applicable to the fuels, plants or furnace types in use in the latter years of the inventory time series. The ERT notes that the IPCC good practice guidance does not require the continuous measurement of emissions but accurate results could be based on periodic measurements. The ERT strongly recommends that Japan provide additional information in its annual submission to transparently justify the validity of these measurement data and the appropriateness of the measurements to the current boiler types/technologies and also encourages the Party to initiate a new measurement programme on the boilers/furnaces which statistically use the most fuel to validate and improve the current CH_4 and N_2O EFs, or consider using default values from the Revised 1996 IPCC Guidelines.

Civil aviation: liquid fuels – CO_2, CH_4 and N_2O[5]

32. CO_2 emissions from civil aviation is a key category for Japan and N_2O emissions from civil aviation is the most significant key category when uncertainty is taken into account (tier 2 key category analysis). The ERT notes that the Party uses a tier 2a approach from the IPCC good practice guidance to estimate jet fuel consumption and a landing/take-off (LTO) fuel consumption factor of 850 kg jet fuel/LTO for an average fleet from the Revised 1996 IPCC Guidelines (volume 3, table 1-52). Japan uses the same LTO EF for all years of the time series (1990–2011). The ERT considers that the aircraft fleet used for civil aviation would have changed significantly over time and therefore encourages Japan to collect detailed information on aircraft by type and use a tier 2b method based on individual aircraft types or a modified tier 2a method based on aggregated fuel consumption EFs for the most significant aircraft types in use in Japan, in order to improve the accuracy of the emission estimates.

Road transportation: gaseous fuels – CO_2, CH_4 and N_2O[6]

33. Japan reported the CO_2, CH_4 and N_2O emissions from and AD for natural gas powered vehicles for 2010 and 2011 in its CRF tables. The CO_2 emissions and AD for the remaining years of the time series (1990–2009) are reported together under the category commercial/institutional and the notation key included elsewhere ("IE") has been used to report the AD for and CO_2 emissions from natural gas in CRF table 1.A(a). Japan has estimated the vehicle-kilometre travel data for natural gas vehicles for all years from 1990 to 2011 and has reported the data in NIR table 3-22. These data are currently used to estimate CH_4 and N_2O emissions from natural gas vehicles. The ERT recommends that Japan collect AD on the natural gas consumed by vehicles for the historical years (1990–2009) or estimate the fuel consumed using the annual vehicle-kilometre data

[5] Not all emissions related to all gases under this category are key categories, particularly CH_4 emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

[6] Not all emissions related to all gases under this category are key categories, particularly CH_4 emissions. However, since the calculation procedures for issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

reported in NIR table 3-22 and report these AD and all emissions for all years of the time series under road transportation.

4. Non-key categories

Railways: solid fuels – CO_2

34. Japan estimated and reported CH_4 and N_2O emissions from coal used in steam locomotives under railways in CRF table 1.A(a). Japan used the notation key "IE" to report the fuel amount and the associated CO_2 emissions, stating that emissions are reported under the category commercial/institutional. The ERT notes that Japan provided the AD for coal consumption in NIR table 3-25 for all years from 1990 to 2011. The ERT recommends that Japan report the coal consumption AD and the associated CO_2 emissions under railways, in order to improve transparency and enable the comparability of the EFs for all gases while ensuring that emissions are not double counted under commercial/institutional.

Other transportation: gaseous fuels – CO_2, CH_4 and N_2O

35. Japan has an extensive town gas/natural gas pipeline network extending to 246,197 km, according to NIR table 3-53. The ERT notes that Japan has not reported any combustion emissions associated with the pumping and compression of gas under other transportation. In response to a question raised by the ERT during the review, the Party stated that the gas pipelines are owned by industries and that all emissions associated with the fuel used by these industries are included under the categories energy industries or manufacturing industries and construction. The ERT recommends that Japan report the AD and emissions associated with the fuel used for pipeline transport under other transportation or report the AD and emissions using a notation key in CRF table 1.A(a) and provide a description of the approach taken in the NIR.

C. Industrial processes and solvent and other product use

1. Sector overview

36. In 2011, emissions from the industrial processes sector amounted to 67,163.75 Gg CO_2 eq, or 5.1 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 97.15 Gg CO_2 eq, or 0.01 per cent of total GHG emissions. Since the base year, emissions have decreased by 44.0 per cent in the industrial processes sector, and decreased by 66.2 per cent in the solvent and other product use sector. The key drivers for the fall in emissions in the industrial processes sector are: for CO_2 emissions – the decline in the production of clinker, steel and chemicals; for N_2O emissions – the use of abatement methods in adipic acid production; for HFC emissions – the use of destruction methods in the production of HCFC-22; and for PFC and SF_6 emissions – the promotion of substitute material use and the capture and destruction of these gases. Within the industrial processes sector, 36.4 per cent of the emissions were from cement production (CO_2), followed by 28.8 per cent from refrigeration and air-conditioning equipment (HFCs) and 11.7 per cent from limestone and dolomite use (CO_2). Lime production (CO_2) accounted for 8.8 per cent and semiconductor manufacture (HFCs, PFCs and SF_6) for 3.3 per cent. All other categories combined accounted for the remaining 11.0 per cent of emissions from the industrial processes sector.

37. The reasons for the recalculations are more adequately described in the 2013 NIR compared to the previous annual submission. The time series of previously reported and new emission estimates showing the differences per year is provided in the NIR, as recommended in the previous review reports. The ERT welcomes these improvements as they enhance the transparency of the recalculations performed by the Party.

38. The ERT noted that the recommendations made in the previous review report regarding the improvement of the transparency of the methodological descriptions in the NIR have been partly implemented as the descriptions of the high degree of abatement of emissions in fugitive emissions from production of halocarbons and SF_6 have been improved, and some of the category descriptions or methodological issues (e.g. ethylene production, production of HCFC-22, commercial refrigeration and railway silicon rectifiers) have been described in more detail. However, there is still a lack of transparency regarding the descriptions of references as the assumptions and expert judgement used have seldom been reported. In some cases, it is not clear for which years the emission estimates have been provided, especially for F-gases. In response to a question raised by the ERT during the review, Japan explained that the use of HFC-152a in aerosols started in 2000 and the production of metered dose inhalers using HFC-134a started in 1997 and those using HFC-227ea started in 2001. The ERT welcomes the above-mentioned improvements in the descriptions and recommends that Japan clearly provide descriptions of all assumptions and expert judgement used, and include information explaining the years for which the estimates have been calculated with the descriptions of the AD, in order to increase the transparency of the inventory.

39. Japan has reported in the NIR some information on which methodological tier is used to calculate the emissions from a certain category. In response to a question raised by the ERT during the review, the Party explained that in many cases it considers that the information is provided in the NIR and the CRF tables combined, provided for an overall view, and that if a country-specific methodology is used it is described. The ERT encourages Japan to include in the NIR information on the methodological tiers used and recommends that the Party specify which EFs are country-specific and which are IPCC defaults, especially for the key categories.

40. Japan has continued to report CO_2 emissions from the use of fuels as anodes or reducing agents in the industrial processes sector (e.g. used in the production of soda ash, coke, iron and steel production, except for electric arc furnace facilities, and ferroalloys and aluminium production) under the energy sector and not under the industrial processes sector. This is not in line with the IPCC good practice guidance, as these CO_2 emissions should be allocated to the appropriate category under the industrial processes sector. In response to a question raised by the ERT during the review, Japan explained that the use of the *General Energy Statistics* and the reporting of all CO_2 emissions under the energy sector ensures the complete accounting of all emissions and avoids double counting. However, the ERT noted that Japan's allocation of emissions is not in line with the IPCC good practice guidance, reduces comparability with other reporting Parties and may distort the key category analysis. The ERT strongly reiterates the recommendation made in the previous review reports that Japan allocate CO_2 emissions from industrial activities in line with the IPCC good practice guidance in its annual submission.

2. Key categories

Lime production – CO_2

41. The ERT noted that Japan used the same EF provided by the Japan Lime Association for the entire time series (0.43 t/t). In response to a question raised by the ERT during the review, the Party explained that this EF was established based on data from 1983, and was re-evaluated in 2009 and determined to be representative of the category for the entire time series. The ERT encourages Japan to check this country-specific EF periodically in order to identify whether it fluctuates between years.

Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6

42. The ERT noted that, for the period 1990–1994, actual F-gas emissions from consumption of halocarbons and SF_6 are still reported as not estimated ("NE"), despite repeated recommendations made in the previous review reports that Japan provide estimates for these years, using extrapolation if necessary. In response to questions raised by the ERT during the review, the Party presented preliminary estimates of actual F-gas emissions for the years 1990–1994. The emissions are estimated using available statistical and domestic shipment data. However, before including the emission estimates in the inventory, Japan indicated that they have to be approved by the Committee for the Greenhouse Gas Emission Estimation Methods. Japan informed the ERT that the missing F-gas emissions for 1990–1994 will be included in the 2014 annual submission. The ERT strongly recommends that Japan report these missing estimates of F-gas emissions for the years 1990–1994 in its annual submission and explain the methodologies used to calculate the estimates.

43. Regarding potential emissions, the ERT noted that Japan generally does not report emissions from production, import and export of halocarbons and SF_6 by gas species or category, but rather reports all emissions as an unspecified mix of listed HFCs or PFCs. In response to a question raised by the ERT during the review, Japan explained that the collection of information on produced, imported and exported amounts of F-gases is performed without classifying the uses in refrigerants, foams, etc. and, therefore, the Party cannot report potential emissions divided by subcategory; hence, all F-gases are reported under other non-specified as an unspecified mix of gases. The ERT notes the Party's response and recommends that Japan include information in its annual submission on why it reports all potential HFC emissions under the category other non-specified and on how the data collection has been performed, in order to improve the transparency of its reporting.

44. The ERT notes that several values have been reported as "zero" in CRF table 2(II).F (e.g. the product manufacturing factor of HFC-152a for hard foam for the period 1998–2011 and the product manufacturing factor of HFC-134a for domestic refrigeration for 2011). The ERT recommends that Japan replace the "zero" values with the correct notation keys.

3. Non-key categories

Silicon carbide production – CH_4

45. The ERT noted that Japan reported the same data for CH_4 emissions from silicon carbide for the years 1999–2011 (0.03 Gg CH_4). In response to a question raised by the ERT during the review, Japan explained that it uses the data received from the General Survey of the Emissions of Air Pollutants and the latest data are from 1999. The Party also explained that it has received new data for 2008 and that it intends to use them for the next annual submission, pending consideration and clearance by the Committee for the Greenhouse Gas Emission Estimation Methods. During the review, Japan provided the ERT with the new value (0.04 Gg CH_4) which showed that the emissions estimate for 2011 was underestimated. In response to the list of potential problems and further questions raised by the ERT during the review, Japan submitted revised CH_4 emission estimates for the entire time series since 2000; for the years 2000–2007 the AD have been interpolated and the AD for 2008 have been used for the years 2008–2011. The EF has not changed since the original 2013 annual submission. The ERT agreed with the estimates presented by Japan.

Aluminium production – PFCs

46. The ERT noted that, for the period 1990–1994, PFC emissions from aluminium production are still reported as "NE", despite repeated recommendations made in the previous review reports that the Party report them. In response to questions raised by the ERT during the review, Japan presented preliminary estimates of PFC emissions from aluminium production for the years 1990–1994. The emissions have been estimated using statistical data. However, these emission estimates have to be approved by the Committee for the Greenhouse Gas Emission Estimation Methods before they are reported in the 2014 annual submission. Japan informed the ERT that the missing F-gas emissions for 1990–1994 will be included in the 2014 annual submission. The ERT strongly recommends that Japan report these missing estimates of PFC emissions for the years 1990–1994 in its annual submission and explain the methodologies used to calculate the estimates.

Solvent and other product use – CO_2

47. In the solvent and other product use sector, Japan has not reported any CO_2 emissions. In response to a question raised by the ERT during the review, the Party stated that it does not intend to report estimates of these CO_2 emissions at present. The ERT noted that the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines) encourage the reporting of these emission estimates and that most reporting Parties do report them. The ERT encourages Japan to report estimates of these emissions in its annual submission.

D. Agriculture

1. Sector overview

48. In 2011, emissions from the agriculture sector amounted to 25,758.06 Gg CO_2 eq, or 2.0 per cent of total GHG emissions. Since 1990, emissions have decreased by 18.4 per cent. The key drivers for the fall in emissions are the decreasing population of cattle, the decreasing area of paddy fields for rice cultivation and the decreasing application of nitrogen (N) fertilizers to cropland. Within the sector, 29.1 per cent of the emissions were from manure management, followed by 25.5 per cent from enteric fermentation, 24.0 per cent from agricultural soils and 21.1 per cent from rice cultivation. The remaining 0.3 per cent were from field burning of agricultural residues.

49. Japan has made recalculations for the agriculture sector in its 2013 annual submission. A three-year average has been used to calculate the emissions from enteric fermentation and manure management. Thus, the emissions for 2007–2010 were recalculated in accordance with the revision and/or the update of the AD for 2008–2011. The ERT encourages Japan to consider using annual livestock and other annual AD instead of three-year averages to avoid recalculations in its annual submissions.

50. Japan has estimated the uncertainties for all categories in the agriculture sector. However, some of these uncertainties are very high in comparison to other Annex I Parties, such as the uncertainties of the emissions from enteric fermentation for swine (50 per cent), and from manure management for all livestock (141 per cent for buffalo, sheep, goats and horses). For emissions from agricultural soils, the uncertainties are even higher: synthetic fertilizers (220 per cent for paddy rice and 212 per cent for tea); crop residues (388 per cent for rye and 392 per cent for oats); and ploughing of organic soil (712 per cent). The ERT encourages Japan to increase its efforts to reduce the uncertainties in the inventory. The ERT welcomes the planned improvements for the EFs and AD for all categories in the agriculture sector, which are very ambitious and will enhance the quality, transparency and accuracy of the inventory. The ERT also encourages Japan to provide additional

information on the improvement plan for the agriculture sector, including timelines for these improvements, in the annual submission.

2. Key categories

Manure management – CH_4 and N_2O[7]

51. The ERT noted that the explanations of the CH_4 and N_2O EFs for the method of treating manure from cattle, swine, hens and broilers (NIR table 6-13, including tables 6-15 and 6-14, respectively) are not very clear. The explanations of the country-specific data and methodology used are not totally transparent and the values of the EFs are lower than the IPCC default values and those of other Annex I Parties. The ERT reiterates the recommendations made in the previous review report that Japan improve the transparency of its reporting by providing additional information on the calculations and data sources used in the annual submission.

52. The ERT appreciates the efforts made by Japan to develop country-specific EFs for CH_4 emissions from pit storage and CH_4 fermentation for dairy cattle (NIR table 6-15). However, the EFs (2.37 per cent and 3.06 per cent, respectively) are lower than the IPCC default values (3.90 per cent and 3.80 per cent, respectively) and the explanation of how they were derived is not sufficiently clear in the NIR. The ERT strongly recommends that Japan provide this explanation in the NIR.

53. In previous review reports, the ERT recommended that Japan revise the information presented in the NIR concerning CH_4 emissions from manure management, in order to enhance the transparency of the inventory. All values for the CH_4 conversion factors for livestock are reported as "NE" in CRF table 4.B(a) and the information on methane conversion factors (MCFs) provided in the NIR is not sufficiently transparent. The ERT reiterates the recommendation made in previous review reports that Japan increase the transparency of the method used to estimate CH_4 emissions from manure management, particularly by providing additional information on the calculations and data sources used for the EFs reported in NIR tables 6-13 and 6-15, and include the MCF values in CRF table 4.B(a).

54. The ERT noted a step-wise increase in the percentage of animal waste management systems (AWMS) by type of animal (NIR table 6-19) for all AWMS. One value per type of animal and AWMS was used for the period 1989–2008 and one for 2009 onwards. In response to a question raised by the ERT during the review, Japan explained that the main reason for the variation in the percentage of manure management is the enforcement of the new Act on the Appropriate Treatment and Promotion of Utilization of Livestock Manure, which has been in force since 1999 and prohibits inappropriate manure management. The previous research leading to the different percentage values for different AWMS was based on the ratio of farmer houses, while the new research is based on the ratio of animal heads. The ERT recommends that Japan explain this issue in the NIR and consider using interpolation to avoid this step-wise change in manure management as the changes occur gradually (NIR table 6-19).

55. Japan has developed a country-specific methodology to estimate N_2O emissions from grazing cattle. As identified by previous review reports, this methodology is not completely transparent (NIR table 6-14). The ERT strongly reiterates the recommendations made in the previous review reports that Japan improve the description of the methodology

[7] Not all emissions related to all gases under this category are key categories, particularly CH_4 emissions. However, since the issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

used and provide additional information regarding the country-specific EFs for cattle livestock for pasture, range and paddock.

Enteric fermentation – CH_4

56. The ERT welcomes the efforts made by Japan to improve the information on the animal characterization. However, the ERT considered that the information on the characterization of livestock is still not sufficiently transparent and recommends that Japan improve the explanations of the assumptions used (e.g. the proportion of the different age classes for dairy and non-dairy cattle (NIR table 6-2)) in its annual submission.

57. The IPCC tier 2 method requires the total energy intake of livestock to be multiplied by the MCF to derive the EF. Japan uses a technique similar to the IPCC tier 2 method, where the EF is derived by multiplying the total energy intake by the MCF, but specific to the country. According to this methodology, the emissions are calculated by multiplying the cattle population by the EFs established based on the dry matter intake. Japan reported in the NIR that the estimation method using the amount of dry matter intake provides more accurate data than the one based on energy intake. However, the explanation provided in the NIR is not sufficiently transparent. In response to a question raised by the ERT during the review, Japan explained that the estimation method for dry matter intake, weight and daily growth are described in the *Japanese Feeding Standard*, which is published in book form. This book describes Japan's domestic standard feeding method and refers exclusively to Japanese cattle. The Party also reported (in section 6.2.1.d of the NIR – source-specific QA/QC and verification) that a comparison between its results and the IPCC tier 2 method was conducted. However, no details have been reported in the NIR. The ERT recommends that Japan improve the description of the methodology used and provide the results of the comparison with the tier 2 IPCC methodology in its NIR.

58. The country-specific EFs for sheep and goats, and swine (4.15 kg/head/year and 1.10 kg/head/year, respectively, in NIR table 6-10) are lower than the IPCC default values (8 kg/head/year for sheep, 5 kg/head/year for goats and 1.5 kg/head/year for swine), but the values used by the Party have not been transparently explained in the NIR. In response to a question raised by the ERT during the review, Japan explained that it considers Japanese swine to be smaller than overseas swine (weight at shipment for fattening swine is about 110 kg), but no information on sheep and goats has been provided in the NIR. The ERT recommends that Japan provide additional information on these EFs in its NIR.

59. The values reported for the milk yield for dairy cattle for the years 2005–2012 are high (over 30 kg/head/day) in comparison to other Annex I Parties. In response to a question raised by the ERT during the review, Japan stated that there may be a possibility that the estimation method used for the current milk yield contains an error and that it will discuss this issue with the livestock experts. The ERT recommends that Japan check the high milk yield data, to ensure the accuracy of the inventory, and report thereon in the NIR.

Agricultural soils – N_2O

60. During the review, the ERT noted that the amount of N input as reported under animal manure applied to soils (340,316,759.28 kg N/year) is lower than the total amount of N excretion per AWMS (674,410,169.39 kg N/year) as reported under N_2O emissions from manure management. The ERT concluded that the amount of N reported under manure management is not consistent with the amount of N used for estimating the emissions from agricultural soils, which is not consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The ERT concluded that direct N_2O emissions from animal manure applied to soils were potentially underestimated. The ERT recommended that Japan provide revised estimates of N_2O emissions from animal manure applied to soils, while ensuring that the N amounts reported under manure management are fully consistent with the N used to estimate direct and indirect N_2O emissions from

agricultural soils. In response to the list of potential problems and further questions raised by the ERT during the review, Japan presented a revised estimation method, as follows:

(a) The N amounts of animal manure applied to soil (ND) described in NIR table 6-51 and the human waste applied to soil (NFU) described in NIR table 6-52 are used as the AD to estimate direct N_2O emissions from animal manure applied to soils in this revision. These AD have already been used as the AD to estimate indirect N_2O emissions from agricultural soils. The AD for the estimation of direct N_2O emissions and indirect N_2O emissions from agricultural soils are now consistent following this revision;

(b) The AD for animal manure applied to soils are disaggregated by crop type to estimate the emissions for each crop using country-specific EFs for three types (see NIR p. 6-26, "Emission factors" and table 6-33);

(c) The ratio used to disaggregate the AD is calculated using the crop area and N amount of organic fertilizer applied per crop area by each crop type, as shown in the following formula:

> N amount of organic fertilizer applied to agricultural soils by each crop type [t-N] = total amount of organic fertilizer applied to soils [t-N] × (crop area by each crop type [ha] × N amount of organic fertilizer per crop area by each crop type [kg-N/10a]) /Σ (crop area by each crop type [ha] × N amount of organic fertilizer per crop area by each crop type [kg-N/10a]).

61. This estimation method is similar to the estimation method used for synthetic fertilizers. The ERT considers the potential problem resolved. Japan submitted revised estimates and provided sufficient documentation. The ERT agreed with the revised emission estimates.

62. For 2011, the amount of N excretion reported in CRF tables 4.B(b) and 4.D is not consistent (9,666,832.67 kg N/year and 5,813,024.89 kg N/year, respectively). Japan has not included the N excreted during grazing for livestock other than cattle when estimating the N_2O emissions from pasture, range and paddock. The ERT concluded that the amount of N reported under manure management is not consistent with the amount of N used for estimating the emissions from pasture, range and paddock under agricultural soils, which is not consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The ERT concluded that direct N_2O emissions from pasture, range and paddock were potentially underestimated. The ERT recommended that Japan provide revised estimates for pasture, range and paddock under agricultural soils, while ensuring consistency with the amount of N excreted under manure management. In response to the list of potential problems and further questions by the ERT during the review, the Party explained that the N_2O emissions from pasture, range and paddock for animals other than cattle had already been estimated in CRF table 4.B as described on page 6-18 of the NIR. Therefore, the N_2O emissions and amount of N from pasture, range and paddock for animals other than cattle have been reallocated from CRF table 4.B to CRF table 4.D in the revised 2013 annual submission. The ERT considers the potential problem resolved. Japan submitted revised estimates and provided sufficient documentation. The ERT agreed with the revised emission estimates.

E. Land use, land-use change and forestry

1. Sector overview

63. In 2011, net removals from the LULUCF sector amounted to 75,434.10 Gg CO_2 eq. Since 1990, net removals have increased by 8.5 per cent. The key driver for the rise in removals is the declining rate of land-use change in settlements and cropland that have

occurred since 1990, resulting in a reduction in emissions in these two categories. Within the sector, 78,085.41 Gg CO_2 eq of removals were from forest land, followed by 1,785.94 Gg CO_2 eq of emissions from cropland and 411.10 Gg CO_2 eq of emissions from settlements. Grassland accounted for removals of 90.21 Gg CO_2 eq and wetlands accounted for emissions of 60.13 Gg CO_2 eq. Of the remaining emissions, 246.78 Gg CO_2 eq were from other and 237.58 Gg CO_2 eq were from other land.

64. Net removals from the LULUCF sector have decreased by 0.4 per cent since 2010. The emissions and removals are accurately reported in the 2013 annual submission. The ERT commends Japan for improving the consistency of the information reported between the NIR and the CRF tables. Net removals increased continuously from 1990 to 2003, from 69,532.34 Gg CO_2 eq to 96,276.44 Gg CO_2 eq, decreased continuously from 2003 to 2009 to 74,088.51 Gg CO_2 eq, increased in 2010 to 75,771.61 Gg CO_2 eq then decreased to 75,434.10 Gg CO_2 eq in 2011. In response to questions raised by the ERT during the review regarding the trends, the Party explained that this declining trend in removals in recent years is due to the maturity of Japanese forests and the decrease in emissions in cropland and settlements due to the reduction in land-use change occurring since 1990 due to the economic recession, as reported in chapter 2 of the NIR. The ERT commends Japan for reporting the trends but found that while the area of cropland has decreased since 1990, the area of settlements has increased and the explanation for the decreasing emissions trend in settlements has not been provided. The ERT reiterates the recommendation made in the previous review report that Japan provide as much information as necessary to explain the trends, in order to improve the transparency of chapter 2 of the NIR, and include this information in the overview section of chapter 7.

65. Japan has provided inventory data for all years from 1990 to 2011 and submitted all of the required CRF tables. The Party has been steadily working on reducing the number of estimates that are not estimated under its continuous improvement programme. In response to a question raised by the ERT during the review, Japan advised the ERT that its focus has been on the Kyoto Protocol activities and pools. Some of the missing estimates from the 2012 annual submission are now estimated and some will be reported for the first time in the 2014 annual submission.

66. Japan reported land-use matrices for the 1990 and the 2011. The Party has not presented a land-use matrix for the period 1990–2011. Therefore, the Party has not demonstrated which land-use changes have been most prevalent in Japan since 1990. In response to a request made by the ERT during the review to provide a matrix for the period 1990–2011, Japan provided matrices for every year of the time series, rather than one single matrix for 1990–2011. The ERT provided Japan with an example of a single matrix for the period 1990–2011. The ERT recommends that Japan report a single matrix for the period 1990–2012 in its annual submission to improve transparency.

67. Japan reported activities that are "very rare" in the NIR, such as non-CO_2 emissions from drainage of soils and biomass burning, as "NO" in the corresponding CRF tables. In response to a question raised by the ERT during the review, the Party informed the ERT that it uses the term "very rare" although the activity can be considered as not occurring because, despite actively searching for it, there is no evidence that this activity occurs (which means that using "NO" for these categories is appropriate). Previous review reports have interpreted "very rare" as occurring, but rarely (i.e. negligible), and recommended that Japan report these negligible emissions or report them as "NE". The ERT recommends that if the Party has verifiable evidence that the activity does not occur, this should be reported in both the NIR and the CRF tables as "NO"; however, if there is no verifiable information to report negligible AD, then this should be reported as "very rare" in the NIR and either the emissions or the notation key "NE" should be reported in the CRF tables.

68. The area of organic soils reported under the LULUCF sector 177.1 kha is not the same as that reported under the agriculture sector (176.64 kha). In response to a question raised by the ERT during the review, Japan explained that a three-year average is used to estimate the area of organic soils in cropland and that the area of organic soils in grassland is not considered to be cultivated. The ERT recommends that the Party include the information provided to the ERT explaining why the area of organic soils under the LULUCF sector is different from the area of cultivated histosols reported under the agriculture sector in the annual submission.

69. The total land area increased by 20 kha between 1990 and 2011. In response to questions raised by the ERT during the review, Japan indicated that the enlargement of the national total area from 37,770 kha to 37,790 kha results from reclamation by drainage and from soil filling of sea areas. The ERT recommends that Japan include this explanation as to why its total land area has increased since 1990 in its annual submission.

2. Key categories

Forest land remaining forest land – CO_2

70. In 2011, the net CO_2 removals in this subcategory amounted to 77,735.12 Gg CO_2. These removals accounted for 99.5 per cent of the total net CO_2 removals from forest land. The net CO_2 removals have increased by 1.5 per cent compared with 1990 and have decreased by 3.9 per cent relative to those reported for 2010. In response to a question raised by the ERT during the review, Japan advised the ERT that it would include explanations for the changes in the removals trend consistent with recommendations made in the previous review report. The ERT reiterates the recommendation made in the previous review report that Japan include explanations for the changes in the removals trend, particularly for those that occur from one year to the next, in its annual submission.

71. The previous review report recommended that Japan provide, in its annual submission, an explanation for reporting the carbon stock pools in bamboo forest as "NA", as well the reasons for using the notation key "NA" to report the dead organic matter (DOM) and soil pools in forests with less standing trees. In response to a question raised by the ERT during the review, the Party explained why the use of the notation key "NA" was appropriate and advised the ERT that this explanation will be included in its annual submission. The ERT reiterates the recommendation made in the previous review report than Japan explain the use of the notation key "NA" where it has been used to report the carbon stock pools in bamboo forest and the DOM and soil pools in forests with fewer standing trees.

72. The carbon stock changes in DOM between 2002 (0.0421 Mg C/ha) and 2011 (–0.0130 Mg C/ha) show large inter-annual fluctuations, ranging between –289.7 per cent and –15.9 per cent. The carbon stock changes in DOM were reported as net emissions for the years 1990–2008 and thereafter as net removals. In response to questions raised during previous review stages, Japan explained that the reported range of the estimates is between –0.1 Mg C/ha and 0.1 Mg C/ha and are therefore not large variations. The Party also explained that the change in the trend is due to the age classes of the intensively managed forests where thinning and harvesting are cyclic, causing annual variations in the contributions to the dead wood pool. The ERT recommends that Japan explain the change in the trend for the carbon stock changes in DOM for this subcategory in its NIR.

73. Japan reported the area of organic soils in forest land as "IE" in CRF table 5.A. In response to a question raised by the ERT during the review, the Party provided the ERT with the area of organic soils in forest land. The ERT recommends that Japan report the area of organic soils in forest land to improve transparency and completeness.

74. The previous review report recommended that Japan report estimates for the carbon stock changes in mineral and organic soils separately, for example by improving the CENTURY-jfos model, and report thereon in its annual submission. The model provided aggregated estimates of the changes in carbon stock for mineral and organic soils. Upon re-examination of the model, the organic soil data were excluded and the model was revised, such that it now provides estimates for the mineral soils only. The ERT notes that Japan reported estimates of the carbon stock changes in mineral and organic soils separately in its 2013 annual submission. The ERT commends Japan for implementing this recommendation.

Land converted to forest land – CO_2

75. In 2011, land converted to forest land represented a minor component of the forest land category (0.5 per cent), accounting for net CO_2 removals of 356.19 Gg CO_2 eq. The estimated net removals have decreased by 9.5 per cent relative to 2010 and by 82.4 per cent since 1990, but Japan has not provided reasons for the steady decrease in net removals from land converted to forest land since 1990. The previous review report recommended that the Party explain the drivers for this decreasing trend in removals in the NIR. In response to a question raised by the ERT during the review, Japan advised the ERT that the trend would be explained in its next annual submission. The ERT reiterates the recommendation made in the previous review report that Japan explain the drivers for this decreasing trend in removals in the NIR.

76. The previous review report recommended that Japan report disaggregated data for wetlands and settlements converted to forest land, currently reported as "IE", in its annual submission, in order to improve the transparency and accuracy of the reporting. In response to a question raised by the ERT during the review, Japan advised the ERT that this issue is under investigation and will be resolved in its next annual submission. The ERT commends the Party for working on the recommendation and reiterates the recommendation made in the previous review report that Japan report disaggregated data for wetlands and settlements converted to forest land, currently reported as "IE" for the period from 1990 to 2005 in order to improve the transparency and accuracy of the reporting.

Land converted to cropland – CO_2

77. The previous review report recommended that Japan provide an estimate of the changes in carbon stocks in soils for mineral and organic soils separately, and provide a better justification for the assumption of zero gains and losses for other land converted to cropland. In response to a question raised by the ERT during the review, the Party explained that carbon gains in living biomass in orchards are not estimated, and that it is currently investigating whether to use tier 1 default values or a country-specific value. Japan advised the ERT that the work is not considered a priority, and also announced that it is likely to report cropland management from 2015 onwards. The ERT commends Japan for its plan to improve the reporting of this key category.

78. The previous review report recommended that Japan improve the transparency of the information on: land-use classification and representation; the different sources of information used for the estimations; and the appropriateness of the ratio used for the conversion of private forest land to other land uses that has been applied to forest land converted to cropland in its annual submission. In response to a question raised by the ERT during the review, Japan advised the ERT that all three points raised will be addressed in its next annual submission. The ERT reiterates the recommendation made in the previous review report the Party included the requested information in the NIR.

79. The previous review report recommended that Japan provide an explanation for the reversal of the decreasing trend in emissions from land converted to cropland in its annual submission. In response to a question raised by the ERT during the review, the Party

explained that when forest is converted to cropland, higher emissions are reported than from other conversions. The proportion of forest land converted to cropland in 2010 was higher compared with that in 2009, when the total area of land converted to cropland was greater than in 2010, but not as much land was converted from forest land. The ERT reiterates the recommendation made in the previous review report that Japan include the explanation for the reversal of the decreasing trend in emissions from land converted to cropland in its NIR.

Land converted to settlements – CO_2

80. The previous review report recommended that Japan provide explanations for the large inter-annual changes in the area and/or net emissions in its annual submission. In response to a question raised by the ERT during the review, Japan explained that the information will be provided in its next annual submission. The ERT reiterates the recommendation made in the previous review report that the Party provide explanations for the large inter-annual changes.

3. Non-key categories

Land converted to grassland – CO_2

81. The previous review report recommended that, in cases where Japan reports all carbon stock changes for settlements converted to grassland as "IE" in CRF table 5.C and indicates that the changes are included under other land remaining other land, the Party report these categories separately in its annual submission to increase the transparency of the inventory. In response to a question raised by the ERT during the review, Japan explained that it has no data on the occurrence of settlements converted to grassland and, therefore, it will change the notation key used to "NO". The ERT reiterates the recommendation made in the previous review report that Japan report the subcategories of land converted to grassland separately in its annual submission. If there are no settlements converted to grasslands Japan should use the notation key "NO" and provide relevant information in the NIR.

Other land remaining other land – CO_2

82. The previous review report concluded that the reporting of abandoned cultivated areas under other land remaining other land was unlikely to be correct, since the changes in the carbon stock in living biomass and soils may still occur after abandonment and the changes in the carbon stock for other land remaining other land are not generally reported, owing to the lack of default methodologies and default EFs. The previous review report recommended that Japan report on this issue in its annual submission. The previous review report also recommended that the Party report the abandoned cultivated areas as a special subcategory under cropland remaining cropland, in order to increase the transparency and accuracy of the reporting, while avoiding double counting. In response to a question raised by the ERT during the review, Japan explained that it will address the recommendation in the next annual submission either by changing the category under which the areas of abandoned cultivated land are reported (i.e. from other land to cropland) or by including an explanation if another solution is found. The ERT reiterates the recommendation made in the previous review report that Japan report the abandoned cultivated areas under an appropriate land-use category in its annual submission.

Direct N_2O emissions from nitrogen fertilization – N_2O

83. The previous review report recommended that Japan explicitly indicate in its next annual submission that the N_2O emissions from forest land are reported in the agriculture sector in the documentation box of CRF table 5(I) and explain, in the NIR, why the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter

referred to as the IPCC good practice guidance for LULUCF) could not be followed. In response to a question raised by the ERT during the review, the Party explained that it had conducted a survey in 2009 to investigate whether this practice occurred, which found there was fertilization occurring in forests and, therefore, work was carried out that will enable the reporting of N_2O emissions from fertilization of forest land in the next annual submission. The ERT recommends that Japan report N_2O emissions from N fertilization of forest land, avoiding double counting of the emissions between the LULUCF and agriculture sectors, in its annual submission.

CO_2 emissions from agricultural lime application – CO_2

84. The previous review report recommended that Japan improve the transparency of the information on the recalculations for CO_2 emissions from lime application in its next annual submission. The recalculations for CO_2 emissions from lime application were explained in section 7.13 of the 2013 annual submission. The ERT commends Japan for improving the transparency of its reporting by providing this information in the 2013 annual submission.

F. Waste

1. Sector overview

85. In 2011, emissions from the waste sector amounted to 20,585.38 Gg CO_2 eq, or 1.6 per cent of total GHG emissions. Since 1990, emissions have decreased by 20.8 per cent. Since 2010, emissions have decreased by 1.8 per cent. The key driver for the fall in emissions is the decrease in landfilled waste due to the development of various waste processing and management practices such as recycling, composting and intermediate processing of waste before incineration. Within the sector, 67.8 per cent of the emissions were from waste incineration, followed by 15.0 per cent from solid waste disposal on land and 13.3 per cent from wastewater handling. The remaining 3.8 per cent were from other (waste), which includes emissions from the decomposition of petroleum-derived surfactants from cleaning products discharged into wastewater treatment facilities and from the composting of organic waste.

86. Due to the complexity of the sector, the reporting requires greater transparency and detail to reflect the diversity and level of disaggregation of the estimated subcategories (see para. 93 below). The ERT recommends that Japan provide, in the NIR, more detailed descriptions of the subcategories and a flow chart of waste management processes for the different types of waste with their interrelations, from their generation to their final destination, in order to improve transparency and facilitate an understanding of how the different portions of waste are distributed among the subcategories and categories. The ERT also noticed inconsistencies with the IPCC terminology in the NIR (see para. 89 below), as well as between the NIR and the CRF tables (see para. 91 below). Therefore, the ERT reiterates the recommendation made in the previous review report that Japan enhance its QA/QC procedures in order to avoid inconsistencies within the NIR and between the NIR and the CRF tables.

87. The ERT commends Japan for implementing some of the planned improvements since the previous annual submission (e.g. the identification of the methane correction factor for different landfill management practices). However, the ERT noted that some of the planned improvements have not yet been implemented, such as the development of a country-specific parameter k for sludge, EFs for industrial wastewater and the estimation of CH_4 recovery from industrial wastewater. The ERT appreciates Japan's intentions and efforts to improve the sectoral assessment and reiterates the encouragement made in the previous review report that the Party include information on the time frames for the implementation of the above-mentioned improvements in its NIR.

2. Key categories

Solid waste disposal on land – CH_4

88. Japan estimated CH_4 emissions from solid waste disposal on land using the tier 2 first order decay method as recommended for the key categories by the Revised 1996 IPCC Guidelines. The AD are collected based on the Japanese classification of municipal solid waste (MSW) types and the EFs used are either country-specific, identified from national studies, or selected from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines), with consideration of Japanese conditions, such as climate, management practices and MSW composition. The Party has no unmanaged landfills and it added an additional subcategory for inappropriately landfilled MSW. In response to a question raised by the ERT during the review about the management of these disposals, Japan explained that they are usually covered with soil and, thus, cannot be accounted as unmanaged. The ERT considers this approach correct and the use of the value 1 for the methane correction factor parameter for managed landfills appropriate. The ERT recommends that Japan include a clear description of this subcategory in its NIR. The ERT also considers that the country-specific classification of MSW composition needs to be described, as it differs from the classification in the Revised 1996 IPCC Guidelines, and recommends that Japan include, in its NIR, a table with a description of the country-specific classes of MSW to explain the correspondence between the two classifications and justify the choice of the relevant IPCC default EFs.

89. As Japan notes in the NIR (pages 8–12) there are no unmanaged landfills in Japan. Given these circumstances, the ERT noted the incorrect use of the notation key "NA" instead of the notation key "NO" with respect to unmanaged landfills in CRF table 6.A, and the use of the notation keys "NA" and "NE" instead of "NA" for CO_2 emissions from unmanaged landfills. The ERT recommends that Japan use appropriate notation key for this category. The ERT also noted the different terminology from the Revised 1996 IPCC Guidelines for some of the parameters (e.g. the term "gas conversion rate" used for the fraction of degradable organic carbon dissimilated and the term "decomposition rate" used for the parameter k). The ERT encourages Japan to use the appropriate terminology of the Revised 1996 IPCC Guidelines for the parameters.

90. The ERT commends Japan for implementing the encouragement made in the previous review report with respect to enhancing the clarity of the method used to calculate the historical data for the period 1954–1980, but considers that the approach used, whereby 1980 is used as the "most close in time" for all years back to 1954, is not a fully appropriate method and encourages Japan to improve the estimation of these data by using more appropriate methods (e.g. using proxy data such as population and/or gross domestic product or a combination thereof).

Wastewater handling – CH_4 and N_2O

91. Japan reported estimates for CH_4 and N_2O emissions from wastewater handling for domestic and commercial, as well as for industrial wastewater handling. The wastewater and sludge in both subcategories are estimated together. Country-specific EFs for domestic and commercial wastewater were identified and were also used for industrial wastewater. The estimates are disaggregated according to the wastewater management systems practised in the country. The industries chosen for estimation were selected according to their biochemical oxygen demand and N concentrations. The ERT commends Japan for the high level of disaggregation and accuracy achieved by using country-specific values. However, the ERT finds that greater clarity is needed in the description of the interconnections of wastewater handling between the different branches to enable the ERT to understand the whole picture of the distribution of the different portions of waste between the waste sector categories and subcategories. The ERT encourages Japan to

include a flow chart for these interconnections in its NIR to improve the transparency of its reporting. The ERT also noted some inconsistencies between the NIR and CRF table 6.B, namely in the lists of selected industries in NIR table 8-15 and CRF table 6.B. The ERT also noted the incorrect use of notation keys with respect to the estimated subcategories (in CRF table 6.B). As a result of the use of a country-specific EF at a disaggregated level, the figures for the AD and IEF could not be provided in CRF table 6.B. The Party has therefore reported the notation key "NE" for the AD and IEF; however, the correct notation key is "NA". Therefore, the ERT recommends that Japan enhance its QC procedures regarding the consistency between the NIR and the CRF tables, and the use of the notation keys.

92. The ERT found that Japan has estimated CH_4 recovery from domestic and commercial wastewater but has not accounted for it in the total sectoral emissions because of the country-specific method of measuring the emitted CH_4 directly. The ERT recommends that Japan enhance the transparency of the description of the country-specific method with respect to CH_4 recovery from domestic and commercial wastewater. Data on CH_4 recovery from industrial wastewater handling continue to be unavailable. Therefore, the ERT recommends that Japan further explore the possibility of accessing data on CH_4 recovery for industrial wastewater.

Waste incineration – CO_2, CH_4 and N_2O[8]

93. Japan reported CO_2, CH_4 and N_2O emissions from waste incineration for waste incinerated both with and without energy recovery, the former allocated to the energy sector and the latter to the waste sector, in line with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance, describing both types in the NIR in the chapter on the waste sector. Emissions from all three gases have been estimated for all types of waste incinerated in Japan (municipal, industrial and specially controlled solid waste), with a differentiation between the biogenic and non-biogenic fractions, which has been reflected in the CO_2 emission estimates, where the biogenic emissions are not accounted for in the total. The emission estimation methodologies also include a differentiation between the parts of waste incinerated with and without energy recovery. The CO_2 emissions have been estimated based on the carbon content, in accordance with the IPCC good practice guidance, and the CH_4 and N_2O emissions have been estimated using country-specific EFs based on measurements, differentiated by incineration facilities, and taking into consideration their efficiency of combustion. The ERT commends Japan for the high level of disaggregation and accuracy of the estimates but encourages the Party to improve the clarity of the description of the methodology used by avoiding ambiguity in the terms and expressions (e.g. "specially controlled solid waste") and by including in the NIR a flow chart showing the interconnections and final destination of the types of waste incinerated, in order to mitigate the complexity of the description of the subcategory and facilitate its review.

94. The ERT noted that the explanations provided in the NIR on the recalculations conducted by the Party are scarce. The ERT recommends that Japan provide more detailed descriptions of the recalculations in order to improve the transparency of its annual submission.

95. The ERT reiterates the encouragement made in the previous review report that Japan conduct the planned research into the estimation of CO_2 emissions from waste paper, leather and rubber containing fossil fuel-derived carbon and to report thereon in its annual submission.

[8] Not all emissions related to all gases under this category are key categories, particularly CH_4 emissions. However, since the issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

3. Non-key categories

Other (waste) – CO_2, CH_4 and N_2O

96. Japan reported emissions from two activities: decomposition of petroleum-derived surfactants (CO_2) and composting of organic waste (CH_4 and N_2O). The method and EF from the 2006 IPCC Guidelines were used to calculate the emissions from composting of organic waste and a country-specific carbon content-based method was applied to estimate the emissions from decomposition of petroleum-derived surfactants. The ERT commends Japan for including these activities in the inventory.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

97. Table 6 provides an overview of the information reported and parameters selected by Japan under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

	Findings and recommendations
Has the Party reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Sufficient
Identify any elected activities under Article 3, paragraph 4, of the Kyoto Protocol	Activities elected: forest management and revegetation Years reported: 1990, 2008, 2009, 2010 and 2011
Identify the period of accounting	Commitment period accounting
Assessment of the Party's ability to identify areas of land and areas of land-use change	Sufficient

98. In 2011, the afforested or reforested area increased by 0.37 kha to 30.53 kha since 1990, contributing net removals of 462.04 Gg CO_2 eq. In 2011, the deforested area increased by 5.10 kha to 343.60 kha since 1990, contributing a net source of 2,021.92 Gg CO_2 eq. Forest management and revegetation contributed net removals of 52,606.06 Gg CO_2 eq and 1,141.54 Gg CO_2 eq, respectively.

99. The previous review report recommended that Japan improve the transparency of the uncertainty estimates and that the Party report, where possible, disaggregated uncertainty estimates for the AD and EFs in its next annual submission. This issue was discussed with Japan during the review. The Party showed the ERT the uncertainty calculations for revegetation as an example, and demonstrated the difficulty in clearly and transparently providing the level of disaggregation requested in the NIR, due to the many subactivities (e.g. revegetation has eight subactivities) and the way in which the uncertainties are calculated. The ERT reiterates the recommendation made in the previous review report that,

difficulty notwithstanding. Japan more transparently present disaggregated uncertainty calculations in its annual submission to enable the review of the uncertainties.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

100. No problems were identified.

Deforestation – CO_2

101. The previous review report recommended that Japan provide information on the possible over or underestimation of the rate of deforestation based on the use of satellite imagery in its next annual submission. In response to a question raised by the ERT during the review, the Party explained that this recommendation will be addressed in its next annual submission. The ERT strongly reiterates the recommendation made in the previous review report that Japan provide information on the possible over or underestimation of the rate of deforestation based on the use of satellite imagery in its annual submission.

102. In CRF table NIR 2, the area of deforestation activity has been temporarily reported as transitioning from other (i.e. land that has never been reported under a Kyoto Protocol activity) as Japan is unable to estimate separately the area of deforestation occurring within forest management areas as distinct from other managed forests. The previous review report encouraged Japan to separate the origin of the forest area of deforestation activity. During the current review, the Party explained that the decrease in forest management area resulting from deforestation is subtracted from the total area estimated under forest management. The ERT recommends that Japan include information to clarify that the area of deforestation is fully subtracted from the area subject to forest management, and removals are not overestimated under forest management in its annual submission.

103. Japan reported in chapter 11.5.3 of the NIR information on the size and geographical location of the forest areas that have lost cover but which are not yet classified as deforested. In 2011, this area is reported as 1.17 Mha. In response to a question raised by the ERT during the review, Japan informed the ERT that approximately 88 kha have temporarily lost cover due to harvesting or disturbance in 2011. In response to another question raised by the ERT during the review, the Party informed the ERT that the standard time for replanting under the Forest Law is at the latest two years for plantations but up to five years for natural regeneration. On the basis of this information, the ERT considered the area reported for 2011 of 1.17 Mha to be very large in relation to the annual forest cover loss and recommends that Japan review the status of the areas reported as having lost cover but which are not yet classified as deforested. The ERT also recommends that the Party, in its annual submission, either revise the estimate to improve accuracy or provide an explanation for the area reported to improve transparency.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

104. The previous review report recommended that Japan include the appropriate references to the legislation that has motivated the practices or activities that have occurred in "Tennensei-rin" forests since 1990 in its next annual submission. In response to questions raised by the ERT during the review, Japan explained that this information will be included in its next annual submission. The ERT reiterates the recommendation made in the previous review report that the Party include the appropriate references to the legislation that has motivated these practices or activities since 1990 in its NIR.

105. The ERT noted that there is a difference of approximately 10 Mha between the area reported as managed forest in the LULUCF sector under the Convention and the area reported as forest management for the KP-LULUCF activities. The IPCC good practice guidance for LULUCF states that where a difference occurs between the area of land subject to forest management and the area of managed forest, the reason should be explained in the NIR. In response to a question raised by the ERT during the review, Japan explained in more detail than the information provided in the NIR how forest management is distinguished from managed forest by ground plot survey methods. The ERT recommends that Japan include additional information on how forest management is distinguished from managed forest in its NIR.

106. Chapter 4.2.6.2.1 of the IPCC good practice guidance for LULUCF states that in the absence of land-use change, areas without tree cover are considered "forest", provided that the time since the forest cover loss is shorter than the number of years within which tree establishment is expected. Japan has not reported the time frames in its NIR. In response to a question raised by the ERT during the review, Japan explained that the period for tree planting after a harvest event is determined as being within two years at the latest under the standard based on the Forest Law. Longer periods between harvesting and tree planting result in greater preparation costs. Therefore, most cases of tree planting are implemented just after harvesting. In the case of natural regeneration, Japan expects trees to be established within five years following a harvest event. The ERT recommends that Japan report these time frames in its NIR.

Revegetation – CO_2

107. The previous review report recommended that Japan report the non-estimated carbon pools on all land under revegetation as "NE" instead of "NA" in CRF table 5 (KP-I)B.4 in its next annual submission. In response to a question raised by the ERT during the review, the Party explained that this recommendation will be implemented in its next annual submission. The ERT strongly reiterates the recommendation made in the previous review report that Japan report the non-estimated carbon pools or include them as "NE" instead of "NA" in CRF table 5(KP-I)B.4 in its annual submission.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

108. Japan has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[9] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings contained in the SIAR. There were no recommendations reported in the SIAR.

109. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the

[9] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Calculation of the commitment period reserve

110. Japan has reported its commitment period reserve in its 2013 annual submission. The Party reported that its commitment period reserve has not changed since the initial report review (5,335,431,899 t CO_2 eq) as it is based on the assigned amount (5,928,257,666) and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

111. Japan reported that there are changes in its national system since the previous annual submission. The Party described the changes (the "breakout group" (see para. 10 above) on F-gases has been expanded to include emissions of nitrogen trifluoride (NF_3), and an NMVOC task force has been established) in its NIR. The ERT concluded that Japan's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

112. Japan reported that there are minor changes to its national registry since the previous annual submission. The Party described the change, namely the change of the name of the contact of the registry administrator and the change in publicly accessible information that was supplemented with information for 2011 on unit holdings and transactions in its NIR. The ERT concluded that, taking into account the confirmed changes in the national registry, Japan's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

113. Japan reported that there are changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. The Party described the changes in its NIR. Namely, in 2012 Japan proposed the establishment of the East Asia Low Carbon Growth Partnership with the aim of promoting low-carbon growth through regional cooperation among the participating countries of the East Asia Summit. The Party has also promoted the development of the TICAD Strategy for Low-Carbon Growth and Climate-Resilient Development within the framework of the Tokyo International Conference on African Development (TICAD). The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent. The ERT recommends that Japan include as a first sentence in the section of the NIR on the minimization of adverse impacts whether there are changes to the information reported on Article 3, paragraph 14, of the Kyoto Protocol.

114. Along with these actions, Japan reported on the following actions aimed at the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol: in the energy and environmental sectors, Japan is providing technical assistance to developing countries in human resource development by accepting trainees and dispatching experts in the area of energy conservation and the environment, and is

contributing to the sustainable economic growth of developing countries. In addition, the Party assisted China and India in policymaking processes and also estimated the possibility of energy-use reductions in high energy-consuming industries. Japan is providing assistance to oil-producing countries in diversifying their economies, by promoting coordinated actions among regulatory agencies to strengthen surveillance on commodity and futures trading markets and to enhance transparency in order to stabilize the oil market. Lastly, with regard to the development of carbon capture and storage (CCS) technologies, Japan, recognizing the innovative nature of this technology, is actively exchanging information on CCS technologies with other countries and implementing large-scale demonstration projects on the practical use of CCS by 2020, and is also conducting research and development on cost reductions and safety improvements.

III. Conclusions and recommendations

A. Conclusions

115. Table 7 summarizes the ERT's conclusions on the 2013 annual submission of Japan, in accordance with the Article 8 review guidelines.

Table 7
Expert review team's conclusions on the 2013 annual submission of Japan

		Paragraph cross-references
The ERT concludes that the inventory submission of Japan is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Annex A sources[a]	Not complete	42, 46
LULUCF[a]	Not complete	
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Japan has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
The Party's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	Yes	29, 40 and 83
Did the Party provide information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol?	Yes	99, 101, 103, 104, 105 and 106
Japan has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as	Yes	

		Paragraph cross-references
specified by decision 14/CMP.1		
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did Japan provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	Yes	113

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

B. Recommendations

116. The ERT identified the issues for improvement listed in table 8 below. All recommendations are for the next annual submission, unless otherwise specified.

Table 8
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph reference*
Cross-cutting	Inventory planning	Move all information in annex 6.1 to the NIR to chapter 1 and also include additional information as contained in the presentation on the national system provided to the ERT during the review	11
	Inventory preparation	Strengthen QC procedures in order to avoid inconsistencies between the NIR and the CRF tables	13
	Follow-up to previous reviews	Improve the text descriptions in the NIR to ensure that the recalculations for all categories are transparently described	17
		Consider ways to address the implementation of the ERT's recommendations in a timely manner	18
Energy	Sector overview	Provide additional information on the drivers of the trends for the energy sector in particular, information on electricity consumption, the quantity of oil refined, vehicle statistics and fuel use in transport, household	21

Sector	*Category*	*Recommendation*	*Paragraph reference*
		numbers and occupancy levels as provided to the ERT during the review	
	Comparison of the reference approach with the sectoral approach and international statistics	Complete the documentation box in CRF table 1.A(c), briefly explaining the differences between the two approaches and referencing the information provided in annex 4 to the NIR	23
		Address the inconsistency in the reporting of coal production, which is included in CRF table 1.B but not in CRF table 1.A(b), by providing coal production data in CRF table 1.A(b)	24
	International bunker fuels	Provide additional information on the method used to derive the country-specific EF for jet kerosene	26
	Feedstocks and non-energy use of fuels	Report the CO_2 emissions from solid fuels used as feedstock under the industrial processes sector	27
		Provide additional information clearly showing the feedstock amounts for each fuel type and the corresponding category where emissions occur or carbon is stored, consistent with the information provided in CRF table 1.A(d), and revise tables 3-12, 3-13, 3-28 and 3-31 of the NIR, clarifying the references to fuel codes "#9xxx"	28
	Stationary combustion: liquid, solid and gaseous fuels – CH_4 and N_2O	Provide in the NIR a table showing all country-specific CH_4 and N_2O EFs, by individual fuel, category and furnace type, elaborating on the information currently provided in NIR table 3-10	30
		Provide additional information on the actual measurements recorded and on how these measurement data are used to derive the EFs	30
		Provide additional information to transparently justify the validity of the measurement data and the appropriateness of these measurements to current boiler types/technologies	31
	Road transportation: natural gas – CO_2, CH_4 and N_2O	Collect AD on the natural gas consumed by vehicles for the historical years 1990–2009 or estimate the fuel consumed using the annual vehicle–kilometre data reported in NIR table 3-22 and report these AD and all emissions for all years of the time series under road transportation	33
	Railways: solid fuels – CO_2	Report the coal consumption AD and the associated CO_2 emissions under railways in order to improve transparency and enable the comparability of the EFs for all gases, while ensuring that emissions are not double counted under commercial/institutional	34
	Other transportation: natural gas – CO_2, CH_4 and N_2O	Report the AD and emissions associated with fuel used for pipeline transport under other transportation or report the AD and emissions using a notation key in CRF table 1.A(a) and provide a description of the approach taken in	35

Sector	*Category*	*Recommendation*	*Paragraph reference*
		the NIR	
Industrial processes and solvent and other product use	Sector overview	Clearly provide descriptions of all assumptions and expert judgement used and include information explaining the years for which the estimates have been calculated with the descriptions of the AD	38
		Specify which EFs are country-specific and which are IPCC defaults, especially for the key categories	39
		Allocate CO_2 emissions from industrial activities in line with the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*	40
	Consumption of halocarbons and SF_6 – HFCs, PFCs and SF_6	Report the missing estimates of F-gas emissions for the years 1990–1994 in the annual submission and explain the methodologies used to calculate the estimates	42
		Include information on why all potential HFC emissions are reported under the category other non-specified and how the data collection has been performed	43
		Replace the "zero" values reported for some HFCs with the correct notation keys	44
	Aluminium production – PFCs	Report the missing estimates of PFC emissions for the years 1990–1994 and explain the methodologies used to calculate the estimates	46
Agriculture	Manure management – CH_4 and N_2O	Provide additional information on the calculations and data sources used	51
		Provide an explanation in the NIR of how the CH_4 emissions from pit storage and CH_4 fermentation for dairy cattle have been derived	52
		Increase the transparency of the method used to estimate CH_4 emissions from manure management, particularly by providing additional information on the calculations and data sources used for the EFs reported in NIR tables 6-13 and 6-15 and include the MCF values in CRF table 4.B(a)	53
		Explain the step-wise increase in the percentage of AWMS by type of animal for all AWMS and consider using interpolation to avoid this step-wise change in manure management as the changes occur gradually	54
		Improve the description of the methodology used and provide additional information regarding the country-specific EFs for cattle livestock for pasture, range and paddock	55
	Enteric fermentation – CH_4	Improve the explanations of the assumptions used for the livestock characterization (e.g. the proportion of the different age classes for dairy and non-dairy cattle)	56
		Improve the description of the methodology used to derive the CH_4 EF and provide the results of the	57

Sector	*Category*	*Recommendation*	*Paragraph reference*
		comparison with the tier 2 IPCC methodology	
		Provide additional information on the CH_4 EFs for sheep, goats and swine	58
		Check the high milk yield data to ensure the accuracy of the inventory, and report thereon in the NIR	59
LULUCF	Sector overview	Provide as much information as necessary to explain the trends, in chapter 2 of the NIR, and include this information in the overview section of chapter 7	64
		Report a single matrix for the period 1990–2012	66
		If Japan has verifiable evidence that the activity does not occur, this should be reported in both the NIR and the CRF tables as "NO"; however, if there is no verifiable information to report negligible AD, then this should be reported as "very rare" in the NIR and either the emissions or the notation key "NE" should be reported in the CRF tables	67
		Provide information explaining why the area of organic soils under the LULUCF sector is different from the area of cultivated histosols reported under the agriculture sector	68
		Include an explanation as to why the total land area has increased since 1990	69
	Forest land remaining forest land – CO_2	Include explanations for the changes in the removals trend, particularly for those that occur from one year to the next	70
		Explain the use of the "NA" notation key where it has been used for carbon stock pools in bamboo forest and the DOM and soil pools in forests with fewer standing trees	71
		Explain the change in the trend for the carbon stock changes in DOM for this subcategory	72
		Report the area of organic soils in forest land in the annual submission to improve transparency and completeness	73
	Land converted to forest land – CO_2	Explain the drivers for the decreasing trend in removals for land converted to forest land in the NIR	75
		Report disaggregated data for wetlands and settlements converted to forest land, currently reported as "IE" for the period from 1990 to 2005	76
	Land converted to cropland – CO_2	Improve the transparency of the information on: land-use classification and representation; the different sources of information used for the estimations; and the appropriateness of the ratio used for the conversion of private forest land to other land uses that has been applied to forest land converted to cropland	78

Sector	*Category*	*Recommendation*	*Paragraph reference*
		Include the explanation provided for the reversal of the decreasing trend in emissions from land converted to cropland	79
	Land converted to settlements – CO_2	Provide explanations for the large inter-annual changes in the area and/or net emissions	80
	Land converted to grassland – CO_2	Report the subcategories of land converted to grassland separately	81
	Other land remaining other land – CO_2	Report the abandoned cultivated areas under an appropriate land-use category	82
	Direct N_2O emissions from nitrogen fertilization – N_2O	Report N_2O emissions from N fertilization of forest land, avoiding double counting of the emissions between the LULUCF and agriculture sectors	83
Waste	Sector overview	Provide, in the NIR, more detailed descriptions of the subcategories, references to all national studies used for the calculations and a flow chart of waste management processes for the different types of waste with their interrelations, from their generation to their final destination	86
		Enhance the QA/QC procedures in order to avoid inconsistencies within the NIR and between the NIR and the CRF tables	86
	Solid waste disposal on land – CH_4	Include a clear description of inappropriately landfilled MSW in the NIR	88
		Include, in the NIR, a table with a description of the country-specific classes of MSW to explain the correspondence between the two classifications and justify the choice of the relevant IPCC default EFs	88
		Use appropriate notation keys	89
	Wastewater handling – CH_4 and N_2O	Enhance the QC procedures regarding the consistency between the NIR and the CRF tables and the use of the notation keys	91
		Enhance the transparency of the description of the country-specific method with respect to CH_4 recovery from domestic and commercial wastewater	92
		Reflect the CH_4 recovery values in the total sectoral emissions and further explore the possibility of accessing data on CH_4 recovery for industrial wastewater	92
	Waste incineration – CO_2, CH_4 and N_2O	Provide more detailed descriptions of the recalculations	94
KP-LULUCF	Overview	Present more transparently disaggregated uncertainty calculations in the annual submission to enable the review of the uncertainties	99
	Deforestation – CO_2	Provide information on the possible over or underestimation of the rate of deforestation based on the	101

Sector	*Category*	*Recommendation*	*Paragraph reference*
		use of satellite imagery	
		Include information to clarify that the area of deforestation is fully subtracted from the area subject to forest management, and removals are not overestimated under forest management	102
		Review the status of the areas being reported as having lost cover but which are not yet classified as deforested	103
		Revise the estimate of the forest areas that have lost cover but which are not yet classified as deforested to improve accuracy, or provide an explanation for the area reported	103
	Forest management – CO_2	Include the appropriate references to the legislation that has motivated the practices or activities since 1990	104
		Include additional information on how forest management is distinguished from managed forest	105
		Report the time frames for tree planting after harvest	106
	Revegetation – CO_2	Report the non-estimated carbon pools as "NE" instead of "NA" in CRF table 5(KP-I)B.4	107
Article 3, paragraph 14		Include as a first sentence in the section of the NIR on the minimization of adverse impacts whether there are changes to the information reported on Article 3, paragraph 14, of the Kyoto Protocol	113

Abbreviations: AD = activity data, AWMS = animal waste management system, CRF = common reporting format, DOM = dead organic matter, EF = emission factor, ERT = expert review team, F-gas = fluorinated gas, IE = included elsewhere, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, MCF = methane correction factor, MSW = municipal solid waste, NA = not applicable, NE = not estimated, NIR = national inventory report, NO = not occurring, QA/QC = quality assurance/quality control.

IV. Questions of implementation

117. No questions of implementation were identified by the ERT during the review.

Annex I

Background data on recalculations and information to be included in the compilation and accounting database

Table 9
Recalculations in the 2013 annual submission for the base year and the most recent year

	1990	*2010*	*1990*	*2010*	
Greenhouse gas source and sink categories	*Value of recalculation (Gg CO_2 eq)*		*Per cent change*		*Reason for the recalculation*
1. Energy	0.07	–649.18	0.0	–0.1	Changed AD and EF
A. Fuel combustion (sectoral approach)	0.07	–649.19	0.0	–0.1	
1. Energy industries		–838.96		–0.2	
2. Manufacturing industries and construction	0.07	195.01	0.0	0.1	
3. Transport		525.56		0.2	
4. Other sectors		–530.79		–0.3	
5. Other					
B. Fugitive emissions from fuels		0.00		0.0	
1. Solid fuels					
2. Oil and natural gas		0.00		0.0	
2. Industrial processes	–58.31	–48.67	–0.0	–0.1	Changed AD and methodological changes
A. Mineral products	–58.31	–102.94	–0.1	–0.3	
B. Chemical industry	0.00	0.08	0.0	0.0	
C. Metal production		0.00		0.0	
D. Other production					
E. Production of halocarbons and SF_6					
F. Consumption of halocarbons and SF_6		54.18		0.2	
G. Other					
3. Solvent and other product use					
4. Agriculture	304.62	382.95	1.0	1.5	Changed AD, EFs and methodological changes
A. Enteric fermentation		–15.64		–0.2	
B. Manure management	–181.37	–124.13	–2.1	–1.6	
C. Rice cultivation		25.45		0.5	
D. Agricultural soils	491.39	501.39	6.2	8.9	
E. Prescribed burning of savannas					
F. Field burning of agricultural residues	–5.40	–4.12	–4.0	–5.5	
G. Other					

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
5. Land use, land-use change and forestry	543.10	–2 592.52	–0. 8	3.5	Changed AD, EFs and methodological changes
A. Forest land	2.29	–4 634.49	0.0	6.0	
B. Cropland	1 129.83	1 497.56	43.4	326. 6	
C. Grassland	178.08	158.83	–40.1	–73.6	
D. Wetlands	–17.76	4.44	–20.7	5.4	
E. Settlements	–626.30	370.06	–15.16	14.7	
F. Other land	–123.06	38.31	–7.9	10.0	
G. Other	0.02	–27.23	0.0	–10.1	
6. Waste	184.64	78.84	0.72	0.4	Changed AD, EFs and methodological changes
A. Solid waste disposal on land	–7.68	16.10	–0.1	0.5	
B. Wastewater handling	218.72	337.93	6.4	14.1	
C. Waste incineration	–26.40	–313.55	–0.2	–2.2	
D. Other		38.37		4.5	
7. Other					
Total CO_2 equivalent without LULUCF	**431.01**	**–236.07**	**0.0**	**–0.0**	
Total CO_2 equivalent with LULUCF	**974.11**	**–2 828.59**	**0.1**	**–0.2**	

Abbreviations: AD = activity data, EF = emission factor, I ULUCF = land use, land-use change and forestry.

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2011, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	5 335 431 899			5 335 431 899
Annex A emissions for 2011				
CO_2	1 240 684 470			1 240 684 470
CH_4	20 299 015	20 299 097		20 299 097
N_2O	21 623 639	21 979 422		21 979 422
HFCs	20 467 028			20 467 028
PFCs	3 016 351			3 016 351
SF_6	1 637 852			1 637 852
Total Annex A sources	**1 307 728 354**	**1 308 084 220**		**1 308 084 220**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–462 036			–462 036
3.3 Afforestation and reforestation on harvested land for 2011	NA			NA
3.3 Deforestation for 2011	2 021 918			2 021 918
Activities under Article 3, paragraph 4, for 2011[c]				
3.4 Forest management for 2011	–52 606 058			–52 606 058
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011	–1 141 535			–1 141 535
3.4 Revegetation in the base year	–77 872			–77 872

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	1 191 068 267			1 191 068 267
CH_4	20 740 567	20 740 649		20 740 649
N_2O	21 993 439	22 358 526		22 358 526
HFCs	18 307 235			18 307 235
PFCs	3 408 706			3 408 706
SF_6	1 862 425			1 862 425
Total Annex A sources	**1 257 380 638**	**1 257 745 809**		**1 257 745 809**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–456 017			–456 017
3.3 Afforestation and reforestation on harvested land for 2010	NA			NA
3.3 Deforestation for 2010	5 067 444			5 067 444
Activities under Article 3, paragraph 4, for 2010[c]				
3.4 Forest management for 2010	–53 286 104			–53 286 104
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010	–1 128 234			–1 128 234
3.4 Revegetation in the base year	–77 872			–77 872

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	1 141 465 308			1 141 465 308
CH_4	21 174 754	21 174 836		21 174 836
N_2O	22 537 133	22 946 898		22 946 898
HFCs	16 554 169			16 554 169
PFCs	3 265 253			3 265 253
SF_6	1 851 273			1 851 273
Total Annex A sources	**1 206 847 890**	**1 207 257 738**		**1 207 257 738**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–441 268			–441 268
3.3 Afforestation and reforestation on harvested land for 2009	NA			NA
3.3 Deforestation for 2009	3 277 132			3 277 132
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009	–48 732 584			–48 732 584
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009	–1 110 444			–1 110 444
3.4 Revegetation in the base year	–77 872			–77 872

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	1 213 829 506			1 213 829 506
CH_4	21 750 206	21 750 289		21 750 289
N_2O	22 664 342	23 117 142		23 117 142
HFCs	15 298 297			15 298 297
PFCs	4 615 056			4 615 066
SF_6	3 795 216			3 795 216
Total Annex A sources	**1 281 952 633**	**1 282 405 515**		**1 282 405 515**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–426 829			–426 829
3.3 Afforestation and reforestation on harvested land for 2008	NA			NA
3.3 Deforestation for 2008	2 644 683			2 644 683
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008	–46 917 903			–46 917 903
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008	–1 079 999			–1 079 999
3.4 Revegetation in the base year	–77 872			–77 872

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

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UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Elsa Hatanaka (Greenhouse Gas Inventory Office of Japan), including additional material on the methodologies and assumptions used.

Annex III

Acronyms and abbreviations

AD	activity data
AWMS	animal manure management system
C	carbon
CCS	carbon capture and storage
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
DOM	dead organic matter
EF	emission factor
ERT	expert review team
F-gas	fluorinated gas
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
ha	hectare
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kg	kilogram (1 kg = 1,000 grams)
kha	kilohectare (1 kha = 1,000 hectare)
km	kilometre (1 km = 1,000 metre)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LTO	landing/take off
LULUCF	land use, land-use change and forestry
MCF	methane correction factor
Mg	megagram (1 Mg = 1 tonne)
Mha	megahectare (1 Mha = 10^6 hectare)
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NF_3	nitrogen trifluoride
NIR	national inventory report
NMVOC	non-methane volatile organic compounds
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report

t	tonne (1 tonne = 1,000 kg)
TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change